

It would thus appear that by studying the extinction curves it may be possible to approximate to the three positions in the spectrum which the colours giving the nearest approach to the three fundamental sensations on the Young-Helmholtz theory occupy.

III. "Researches on the Structure, Organisation, and Classification of the Fossil Reptilia. VII. Further Observations on *Pareiasaurus*." By H. G. SEELEY, F.R.S., Professor of Geography in King's College, London. Received May 5, 1891.

(Abstract.)

The author distinguishes five zones of life in the Karoo rocks, which are termed, counting from the bottom, Mesosaurian, Pareiasaurian, Dicynodont, Theriodont, and Zanclostodont. The Pareiasaurian zone extends between the Prince Albert Road station and the Nieuwveldt range of mountains. He obtained a nearly complete skeleton from Bad, east of Tamboer, a less complete skeleton from Tamboer Fontein, and a portion of jaw from near Klipfontein, on the summit of the Nieuwveldt range. These materials show almost every part of the skeleton except some details of the carpus and tarsus, and the number of digits.

The skull shows in both specimens the structure of the palate, which was closed in the median line, and almost covered with teeth, which extend in four principal longitudinal rows on the vomera and pterygoids. The teeth are slender, cylindrical, and recurved. There are two oblique rows, half as long as the others, on the palatines. They converge backward. Other teeth occur in rows behind these, and in front of them. The posterior nares open behind the pterygoids on the basi-sphenoid. The pterygoid bones diverge backwards to meet the quadrate bones, which are wedged in between them and the bones of the cheek. On the outer border of the side of the quadrate is a perforation like that figured 'Phil. Trans.,' B, 1889, Pl. 10, fig. 4, only smaller. The brain case has the same sort of relation to the roof bones of the skull, as in marine Chelonia. The brain case is depressed behind. The occipital condyle appears to be formed by the basi-occipital in its lower half, and by the ex-occipitals in its upper half. It is concave, and was margined below by a semi-circular intercentral bone. A similar intercentral ossification occurs behind it, below the atlas. The surface of the skull has no opening except the nares, orbits, and the large parietal foramen. Its posterior border is concavely notched. The surface shows the same pitted and channelled ornament as in the specimen already described.

The vertebral column is complete with the exception of a few small terminal vertebrae of the tail. No neural arch has been found to the

first vertebra. The processes for articulation with the dorsal ribs have elongated facets, which are rarely divided into diapophyses and parapophyses. The sacrum includes four vertebræ, of which the first is sacro-lumbar and the last two sacro-caudal. Chevron bones are well developed along the tail.

The shoulder girdle is placed far forward; the precoracoid, coracoid, and scapula are anchylosed together. The scapula is expanded and elongated, extending backward towards the ilium. The clavicular arch includes five bones. The interclavicle has a descending median bar, which expands transversely between the coracoids; its transverse bar unites with the clavicles, which rest upon the scapulæ. They only extend half-way along the length of the superior margins of the scapulæ. Beyond that point is another pair of bones which represent the supraclavicles, as in Fishes and Labyrinthodonts.

The pelvis is entirely Mammalian in form. The pubes are almost entirely behind the iliac bones, and unite with the ischia to form a continuous sheet of bone, the two sides being inclined to each other and meeting in a ventral symphysis. There is only a small perforation through the pubis, and no perforation between the pubis and ischium, as in Mammals. The transverse processes from the four sacral vertebræ meet the expanded blade of the ilium along its length on each side.

The limbs are massive and short; the femur shows characters which have previously been regarded as belonging to the humerus. The distal end of the bone is perforated. The lesser trochanter is strongly developed. The tibia is large and massive, and the fibula slender. These bones are much shorter than the femur. The os calcis is of large size, and articulates with both the fibula and tibia; the astragalus is small. The tarsal bones of the distal row are small and separate; their relations to each other not definitely determined. The metatarsal bones are strong and short; the phalanges are short, and terminate in massive, long, flattened claws. In the fore-limb the humerus is greatly expanded at both ends with a large deltoid crest. The condyles of its distal end are well rounded; the radius is short and massive; the ulna expands at its proximal end, and is produced according to the Mammalian plan so as to receive the distal end of the humerus. The carpus is imperfectly known. The digits were stronger than those of the hind limb, and terminated in similar claws.

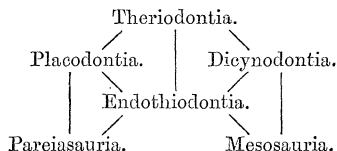
The specimens show that in characters of the teeth and mandible there is nothing to distinguish *Anthodon* from *Pareiasaurus*; and that the genus *Propappus* apparently has no existence, being founded on a femur. One species is named *Pareiasaurus Bainii*, another is *Pareiasaurus Russauvi*.

All the affinities hitherto attributed to *Pareiasaurus* with Labyrinthodonts, Anomodonts, *Procolophon*, and Mammals are shown more

strongly in the several parts of the skeleton, by the new evidence. The shoulder girdle is more Labyrinthodont than was previously supposed, the skull is more Reptilian, and the pelvis and limbs are more Mammalian, though with some resemblance to Dinosaurs.

From further evidence of the structure of the skeleton in *Procolophon*, the author regards that type as a member of the Pareiasauria, rather than as forming a distinct sub-order. It also has four sacral vertebræ.

The divisions of the Anomodontia are grouped as—



The relations of the Anomodontia to other Vertebrata are expressed in the following grouping:—

